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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/668,245 | 09/24/2003 | Kyoko Izuha | 04329.3147 | 2059 |

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| EXAMINER | |
|---|---|
| ROSASCO, STEPHEN D | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1756 | |

DATE MAILED: 09/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/668,245 | IZUHA ET AL. | |
| | Examiner | Art Unit | |
| | Stephen Rosasco | 1756 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *02 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) *38-47* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/24/03 3/30/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## Detailed Action

Applicant's election without traverse of Group I (claims 1-37) in the reply filed on 9/02/05 is acknowledged.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Tenjil (2004/0234869).

The claimed invention is directed to a mask comprising: a first area including a first surrounding area in which a halftone phase shift film or a stacked film of a halftone phase shift film and an opaque film is provided on a transparent substrate, and a first opening area surrounded by the first surrounding area; and a second area including a second surrounding area in which a halftone phase shift film is provided on the transparent substrate and a second opening area surrounded by the second surrounding area, wherein a transparent film is provided in at least a part of the second opening area, the transparent film being configured to give a predetermined phase difference to exposure light passing through that part of the second opening area in which the transparent film is provided relative to exposure light passing through the second surrounding area.

And wherein the transparent film comprises a SOG film and an absolute value of the predetermined phase difference is at least 60 degrees and at most 150 degrees.

And wherein a phase difference between exposure light passing through the halftone phase shift film in the first surrounding area and exposure light passing through the first opening area is 180 degree.

The applicant discusses the limitations of the prior art in that in a mask where the transparent substrate 101 is etched to form the holes 152, it is possible to give a phase difference of –90 degrees to exposure light passing through the opening portions in the phase shift mark area 20 relative to exposure light passing through the opening portions in the reference mark area 10. However, with the conventional manufacturing method, extra lithography and etching steps such as those shown in FIGS. 21D to 21F are required to form the holes 152 used to create a phase difference of 90 degrees. Thus, the conventional focus monitor mask requires extra lithography steps to obtain a phase difference of 90 degrees.

Tejnil teaches an apparatus comprising: a mask including a focus monitor including a region to produce an effective phase shift to incident light having a wavelength, the region including a plurality of features having a lateral dimension on the mask smaller than the wavelength of incident light.

And wherein the lateral dimension of mask features is less than about one half of the wavelength of the incident light.

And wherein the mask comprises a transmissive material having a surface, and wherein the plurality of features are recessed at a depth from the surface.

And wherein the effective phase shift is in a range of from about 60- 120 degrees (+-m times 180 degree), where m is an integer.

And wherein the effective phase shift is about 90 degrees.

And wherein the plurality of features in the focus monitor have a depth approximately equal to the depth of the primary features.

Tejnil also teach [0021] By providing a focus monitor with an effective phase shift of, e.g., 60 degree to 120 degree using features having the same etch depth as the primary features in the mask, e.g., a 180 degree etch depth, the focus monitor may be produced on the mask using fewer processing steps and at lower cost than by producing a focus monitor by etching the features to a depth corresponding to a 60 degree to 120 degree phase shift.

Tejnil also teach a method comprising: etching primary features into a surface of a phase shift mask, the primary features being etched to a depth operative to cause incident light to be phase shifted about 180.degree.; and etching a plurality of secondary features in a focus monitor region on the phase shift mask, the secondary features having a lateral dimension less than about half a wavelength of the incident light and a depth approximately equal to the depth of the primary features.

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-37 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-10 and 13-23 of U.S. Patent No. 6,440,616. Although the conflicting claims are not identical, they are not patentably distinct from

each other because the claimed mask employs an additional depth for phase shifting, which is known in the art.

Claims 1-37 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-10 and 13-23 of U.S. Patent No. 6,440,616 in view of Kim (6,576,374). Kim teaches a phase shift mask and a method of fabricating a phase shift mask comprising the steps of: forming a light shield layer on the entire surface of a substrate, the light shield layer being substantially opaque to exposure light of a given wavelength and the substrate being transparent to the light; forming a protective layer pattern on the light shield layer; etching portions of the light shield layer using the protective layer pattern as an etch mask to expose first and second regions of the substrate; and while the protective layer pattern remains on a portion of the light shield layer forming the boundary of the second region, forming a phase shift region by etching the second region of the substrate with an etchant to form a groove in the substrate at the second region thereof, wherein the protective layer prevents an interaction between the etchant and the light shield layer at the boundary of the second region.

It would have been obvious to one having ordinary skill in the art to take the teachings of Izuha et al. and combine them with the teachings of Kim in order to make the claimed invention because the applicant is using a known technique for the purpose that it is known to be used in the mask art.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izuha et al. (6,440,616) in view of Kim (6,576,374).

The claimed invention is directed to a mask comprising: a first area including a first surrounding area in which a halftone phase shift film or a stacked film of a halftone phase shift film and an opaque film is provided on a transparent substrate, and a first opening area surrounded by the first surrounding area; and a second area including a second surrounding area in which a halftone phase shift film is provided on the transparent substrate and a second opening area surrounded by the second surrounding area, wherein a transparent film is provided in at least a part of the second opening area, the transparent film being configured to give a predetermined phase difference to exposure light passing through that part of the second opening area in which the transparent film is provided relative to exposure light passing through the second surrounding area.

And wherein the transparent film comprises a SOG film and an absolute value of the predetermined phase difference is at least 60 degrees and at most 150 degrees.

And wherein a phase difference between exposure light passing through the halftone phase shift film in the first surrounding area and exposure light passing through the first opening area is 180 degree.

The applicant discusses the limitations of the prior art in that in a mask where the transparent substrate 101 is etched to form the holes 152, it is possible to give a phase difference of –90 degrees to exposure light passing through the opening portions in the phase shift mark area 20 relative to exposure light passing through the opening portions in the reference mark area 10. However, with the conventional manufacturing method, extra lithography and etching steps such as those shown in FIGS. 21D to 21F are required to form the

holes 152 used to create a phase difference of 90 degrees. Thus, the conventional focus monitor mask requires extra lithography steps to obtain a phase difference of 90 degrees.

Izuha et al. teach, as applicant discusses in the specification, a focus monitor mask used to measure the magnitude of defocus in an exposure apparatus including the sign of the defocus FIG. 20 illustrates an example of this focus monitor mask. This figure schematically shows a planar configuration of a mask pattern formed area.

The teachings of Izuha et al. differ from those of the applicant in that the applicant teaches that the use of a stepped region to create a phase difference of +90 degrees.

Kim teaches a phase shift mask and a method of fabricating a phase shift mask comprising the steps of: forming a light shield layer on the entire surface of a substrate, the light shield layer being substantially opaque to exposure light of a given wavelength and the substrate being transparent to the light; forming a protective layer pattern on the light shield layer; etching portions of the light shield layer using the protective layer pattern as an etch mask to expose first and second regions of the substrate; and while the protective layer pattern remains on a portion of the light shield layer forming the boundary of the second region, forming a phase shift region by etching the second region of the substrate with an etchant to form a groove in the substrate at the second region thereof, wherein the protective layer prevents an interaction between the etchant and the light shield layer at the boundary of the second region.

And wherein the step forming the phase shift region comprises: coating the substrate having the first and second exposed regions with a layer of photosensitive material; patterning the photosensitive layer to expose the second region of the substrate; etching the exposed second region using the photosensitive layer pattern as an etch mask until the thickness of the substrate at the second region thereof is suitable for effecting a phase shift when the mask is in use; and subsequently removing the photosensitive layer pattern.

And wherein the etching comprises anisotropically dry-etching the second region of the substrate with an etch gas, and the step of forming the protective layer comprises forming the protective layer of a material which evaporates in reaction to the etch gas during the etching of the second region of the substrate.

It would have been obvious to one having ordinary skill in the art to take the teachings of Izuha et al. and combine them with the teachings of Kim in order to make the claimed invention because the applicant is using a known technique for the purpose that it is known to be used in the mask art.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Rosasco
Primary Examiner
Art Unit 1756

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09/19/05